



IB MYP YEAR 5
ASSESSMENT TASK

Patterns in Probability

Subject:	Y10 <i>Extended</i> Mathematics	Name : (Class)	<i>Jonathan Boon</i> <i>(10) Trust.</i>
Topic:	Patterns in Probability		
Date of assessment:	Thursday 1 st December (session 2)		

- This task assesses Criteria B and C
- Time allowed – *one hour*
- Write your answers on the file paper provided. GDCs are allowed.

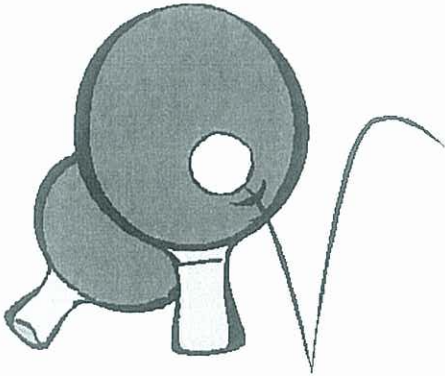
ADVICE:

Read the criteria descriptors and task-specific clarifications carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.

Criterion B		
Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	You are able to answer the early questions, and order your answers in a way that reveals patterns.	The student applies, with some guidance , mathematical problem-solving techniques to recognize simple patterns.
3-4	You develop appropriate systematic methods in order to answer the questions. The results you get help you to suggest a mathematical rule using a,b and N	The student applies mathematical problem-solving techniques to recognize patterns, and suggests relationships or general rules.
5-6	You continue with the questions, and use questions 6 and 7 as a check on your findings.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, and draws conclusions consistent with findings.
7-8	You are able to justify or prove your answer to question 6.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, draws the correct conclusions consistent with findings, and provides justifications or a proof .

Criterion C		
Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	The narrative is basic. Mathematical symbols are used, perhaps with <i>some</i> errors or inconsistencies.	The student shows basic use of mathematical language and/or forms of mathematical representation. The lines of reasoning are difficult to follow .
3-4	The narrative is reasonably easy to follow. Mathematical language is used in a generally accurate way. Mathematical notation is used with few errors.	The student shows sufficient use of mathematical language and forms of mathematical representation. The lines of reasoning are clear though not always logical or complete . The student moves between different forms of representation with some success .
5-6	The narrative is easy to follow. Mathematical arguments are presented logically. Mathematical vocabulary and notation are used accurately and appropriately.	The student shows good use of mathematical language and forms of mathematical representation. The lines of reasoning are concise, logical and complete . The student moves effectively between different forms of representation.

Patterns in Probability



I play table tennis against a friend. The probability I win a point is a and the probability she wins a point is b . These probabilities stay constant throughout the game.
(Note: $a \neq b$)

A game is won only when a player wins two consecutive points.

So, for example, I might win a game where the point rallies go: WLWLWLWW (that is, I win the game because I won the final 2 points).

In the following, simplify your answers wherever possible.

1. Write a simple relationship between a and b .
2. What is the probability I win the first two points (and so win the game)?
3. What is the probability the game lasts for 3 points and I win?
4. What is the probability the game lasts for 4 points and I win?

(You may like to repeat question 4 for when the game lasts for 5 points, or 6, or 7 and so on.)

5. Describe mathematically any patterns you find in these probabilities.
6. What is the probability, in terms of a and b , that the game lasts for N points and I win?
7. If $a = 0.6$, show that the probability I win a game in 5 points or less is approximately 0.625.
8. Write a ***proof*** or ***justification*** of your answer to question 6.



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Math.

1.) $P(a \cap b) = 0$.

It is impossible that they both win the game, only one of them can, so the probability of they both win is zero. The relationship is the probability of a or b winning is $\frac{1}{2}$. Either a win and b lose or b lose and a win.

2.) The $P(\text{win the first 2 points and so win the game}) = \frac{a}{2a} = \frac{1}{2}$.
Half chance of winning the first 2 points as to win the game also.

3.) LWW. $P(\text{the game lasts for 3 points and I win}) = \frac{2}{3}$.
The chance is only Lose, win, win, no other ways because the question said a player must win 2 consecutive points as to win the game. It can't be WLW or LLW.

4.) WLWW. $P(\text{the game lasts for 4 points and I win}) = \frac{3}{4}$.
There are only chance of WLWW, no others, it can't be LWLW or WLWL because a player must win 2 consecutive points as to win the game.

5.) For 5 points. WLWLW - Impossible, 0 probability.
For 6 points. WLWLWW - Possible.
For 7 points. WLWLWLW - Impossible, 0 probability.
For 8 points. WLWLWLWW - Possible.

I find that as the numbers go further, the winning probability is increasing. That's mean if it is a long match, the probability of winning is larger due to the game rule. But it is impossible to win but lose by playing 5 points, 7 points, 9 points game..... The probability of playing an even number game and win is higher.

6.) $P(\text{the game lasts for } N \text{ points and I win}) = \frac{a}{N}$

WLWLWLWL.....N

$P(a \cup b) \text{ win} = \frac{1}{2}$

7.) ~~Q6~~

8.) From Q6, you can see that the probability of the game lasts for N points and win is $\frac{a}{N}$. As you put some numbers into it, prove that it is right.

a is the probability of winning a point and N is the total points you've played.